Buffalo River Area of Concern - Katherine Street Peninsula Habitat Restoration - Design Drawing Change Log	
Description of Design Change	**Note**
Reduced number and complexity of discrete in-water fill placement areas	Original design included six irregularly shaped placement areas with variable slopes through the planting zone. Draft design utilizes one larger placement area comprised of a consistent 3H:1V slope and a flat bench for plantings, providing a larger contiguous planting area.
Revised contouring and volume assumptions to account for in-water fill necessary for planting bed slopes	Original design drawing notes that in-water fill placed for planting beds are to be sloped to existing grades but does not specify slopes required. Such grading may have resulted in in-water fill placed in excess of a 3H:1V slope, which may have led to decreased planting bed stability and risk to the contractor for material replacement.
Relocated SAV planting area from north of boat ramp due to scour concerns	Modeling performed during the Feasibility Study identified the area between existing pier and boat ramp as a high scour zone. Relocated planting area and associated in-water fill from this area to reduce risk of erosion and plant mortality.
Included 5 feet offset from navigation channel for in-water fill placement	Offset will reduce possibility for future slope stability issues due to adjacent navigational dredging. Original design slopes for in-water fill terminated at navigation channel boundary.
Clarified language to reduce confusion over in-water fill TOC requirement	Only virgin material is required for Katherine Street in-water fill. Clarification of necessary fill eliminated added blending for backfill materials.
Revised necessary quantity and length of rock vanes and extended rock vane length to edge of SAV zone	Consolidation of multiple fill placement areas into one contiguous area reduced the need for rock vanes evenly spread along the entire Katherine Street shoreline. Rock vane lengths for those that remained were increased to provide additional protection and sedimentation potential throughout the planting bed.
Changed maximum SAV water depth from 8 feet to 5 feet within in-water fill placement areas	Expect increased survivability in shallower water as well as easier installation of SAV species. In-water fill material subgrade established so that final planting bed grade will be at 5-foot water depth. SAV planting bed elevation was increased in relationship to City Ship Canal bed elevations (6-foot water depth) to account for greater potential of initial erosion of planting bed in Katherine Street Restoration area.
Updated rootwad counts given the revised design layout and added additional log-poles	Revised design adds additional habitat structure to the restoration area.
Maximized planting in pre-existing areas already at elevations required for EV and SAV planting	Planting substrate will be placed directly on existing surfaces prior to planting. Maximizing the surface areas already at acceptable elevations will reduce unnecessary in-water fill placement.
Eliminated need for diver supported installation of mechanical soil anchors for rootwad logs and replaced with new anchoring system	Rootwad logs can be placed with tablet anchors pre-attached so that diver installation is unnecessary.
Optimized placement of rootwad logs into chains to provide protection of EV and SAV areas	Original locations of rootwad logs would not provide protection of EV and SAV. Rootwad chains allow for decreased need for rock vanes and removal of coir logs from the design, and will provide more long term protection of EV plantings. Rootwad logs were used in combination with log poles where possible to provide additional planting area protection.
Removed unnecessary coir log division between EV and SAV planting areas	Original design drawings and specifications required coir logs for Katherine Street between EV and SAV planting areas. Their application in this restoration area would not provide long-term protection of EV plantings. Coir logs were replaced with rootwad chain concept described above.
Revised base backfill material	Updated base fill material gradation to promote slope stability and reduce potential for erosion.

Notes:
EV = emergent vegetation
H:V = horizontal to vertical (ratio)
SAV = submerged aquatic vegetation
TOC = total organic carbon

Buffalo River Area of Concern - City Ship Canal Capping and Habitat Restoration - Design Drawing Change Log	
Description of Design Change	**Note**
Decreased number of elevation control points within fill grading plan for City Ship Canal	Original design had as many as 12 to 15 control points across cross sections. Revised contouring plan was simplified such that it has no more than six control points (not including gravel spawning beds, which have very flexible placement tolerances).
Revised contouring and volume assumptions to account for in-water fill necessary for planting bed slopes	Original design drawing noted that in-water fill placed for planting beds in the northern edge of the restoration area are to be sloped to existing grades but do not specify slopes required. Such grading may have resulted in in-water fill placed steeper than a 3H:1V slope, which may have led to decreased planting bed stability and risk for material replacement.
Updated modeling evaluations demonstrated a sufficiently protective cap was possible using 5.5 feet of clean material	Cap surface revised from original design (that used a reactive layer) to incorporate 5.5 feet of base fill to provide same level of protection without additional TOC addition.
Changed maximum SAV water depth from 8 feet to 6 feet	Expect increased survivability in shallower water as well as easier installation of SAV species.
Updated rootwad counts given the design layout shown in the final design	Revised design adds additional habitat structure to the restoration area.
Adjusted EV/SAV ratio to provide larger, contiguous areas of SAV planting while keeping total planting acreage the same	Larger SAV bench area created at head of the City Ship Canal; changes from EV to SAV area and associated increased water depth will reduce concerns over warming and stagnation effects during summer months and allow increased circulation.
Revised spawning bed concept from island to bench configuration	Habitat islands required additional fill quantities for identical habitat surface area provided. Additionally the habitat islands reduced the navigability of the channel, potentially restricting contractor access to fill areas. Islands have been revised to benched gravel spawning beds collocated with rootwad logs. The spawning beds maintain the same habitat function and area while reducing construction complexity, while also improving access (for maintenance and the public) and circulation.
Allowed flexibility in contractor identification of fish spawning beds	Increased flexibility will allow contractor to coordinate selection of the gravel spawning bed locations with the engineer, provided chosen locations meet the design requirements. Flexibility should allow for more efficient installation and maintenance for this habitat feature.
Incorporated rock-pile habitat structures into the design	Rock piles are a cost-effective habitat structure with precedence on other New York State restoration projects (e.g., Onondaga Lake and Hudson River). Rock piles were added to reduce homogeneity in center of City Ship Canal channel.
Removed unnecessary coir log division between EV and SAV planting areas	Original design drawings and specifications required coir logs in the City Ship Canal between EV and SAV planting areas. Due to the lower energy environment present in the canal, the coir logs were deemed unnecessary and were removed to promote better access for planting and more natural transition zone.

Notes:
Anchor QEA = Anchor QEA, LLC
EV = emergent vegetation
H:V = horizontal to vertical (ratio)
SAV = submerged aquatic vegetation
TOC = total organic carbon

Buffalo River Area of Concern - Riverbend Habitat Restoration - Design Drawing Change Log	
Description of Design Change	**Note**
Revised necessary quantity and length of rock vanes and extended rock vane length to edge of SAV zone	Rock vane lengths for those that remained were increased to provide additional protection and sedimentation potential throughout the planting bed. In some instances rock vanes were replaced with anchored woody debris.
Changed maximum SAV water depth from 8 feet to 6 feet	Expect increased survivability in shallower water as well as easier installation of SAV species. New SAV planting areas were identified to mitigate loss of SAV due to water depth.
Updated rootwad counts given the design layout shown in the final design	Revised design adds additional habitat structure to the restoration area.
Eliminated need for diver supported installation of mechanical soil anchors for rootwad logs and replaced with new anchoring system	Rootwad logs can be placed with tablet anchors pre-attached so that diver installation is unnecessary.
Removed coir log buffer and replaced with coir bank buffer	Coir log buffer was replaced with a coir bank buffer due to constructability and durability concerns.
Eliminated modified LUNKERS from design	LUNKERS were eliminated due to constructability and durability concerns. Loss of habitat resulting from their elimination was mitigated with additional rootwad logs placed up- and downstream of the LUNKERS location.

Notes:

LUNKERS = Little Underwater Neighborhood Keepers Encompassing Rheotactic Salmonids

SAV = submerged aquatic vegetation

Buffalo River Area of Concern - Buffalo Color Peninsula Habitat Restoration - Design Drawing Change Log	
Description of Design Change	**Note**
Revised necessary quantity and length of rock vanes and extended rock vane length to edge of SAV zone	Rock vane lengths for those that remained were increased to provide additional protection and sedimentation potential throughout the planting bed. Rock vanes were added along the eastern side of the restoration area to promote sedimentation of the existing riprap shoreline area.
Changed maximum SAV water depth from 8 feet to 6 feet	Expect increased survivability in shallower water as well as easier installation of SAV species. New SAV planting areas were identified to mitigate loss of SAV due to water depth.
Added anchored rootwad logs to restoration area design	Anchored rootwad logs were added to the western side of the restoration area to provide additional habitat.
Eliminated need for diver supported installation of mechanical soil anchors for rootwad logs and replaced with new anchoring system	Rootwad logs can be placed with tablet anchors pre-attached so that diver installation is unnecessary.
Removed coir log buffer and replaced with coir bank buffer	Coir log buffer was replaced with a coir bank buffer due to constructability and durability concerns.
Eliminated soil choking areas from design	Soil choking was eliminated due to constructability and planting substrate stability concerns. Placement of additional rock vanes within the soil choking area will promote sedimentation of the shoreline and allow for potential natural recruitment of plants in the future.

Notes:

SAV = submerged aquatic vegetation

Buffalo River Area of Concern - Ohio Street Shoreline Habitat Restoration - Design Drawing Change Log	
Description of Design Change	**Note**
Eliminated SAV areas from design	All locations at suitable water depth for SAV planting were located along shoreline slopes steeper than 2H:1V which are unlikely to provide suitable stability for the planting substrate and SAV species.
Removed coir log buffer and replaced with coir bank buffer	Coir log buffer was replaced with a coir bank buffer due to constructability and durability concerns.
Eliminated modified LUNKERS from design	LUNKERS were eliminated due to constructability and durability concerns. Loss of habitat resulting from their elimination was mitigated with additional rootwad logs placed upstream of the LUNKERS location.

Notes:
H:V = horizontal to vertical (ratio)

LUNKERS = Little Underwater Neighborhood Keepers Encompassing Rheotactic Salmonids

SAV = submerged aquatic vegetation

Buffalo River Area of Concern - Habitat Restoration - Specification Change Log	
Description of Specification Change	**Note**
Increased tolerance in final grades from -3 to +1 inches to -6 to +3 inches	Increased grade tolerance will provide more variability to planting area. Increase in tolerance will allow for greater flexibility in placement techniques and production by the contractor. Grade tolerances were factored into identification of EV and SAV planting zone subgrade elevations so that minimum elevations will still be met.
Eliminated requirement for contractor to restore as-built grades following season waiting period prior to planting	Design changes have increased stability of planting bed areas by decreasing slope complexity (City Ship Canal and Katherine Street) as well as through use of a coarser material for Katherine Street subgrade. These measures have reduced the risk of material loss and allowed for the elimination of grade restoration and material replacement after the season waiting period, which will reduce contractor risks. Plantings will be adjusted based on available grades during the planting season.
Revise backfill material specification for City Ship Canal	Contractor will be allowed to use a virgin material for capping/backfilling activities without additional blending requirements based on revised cap modeling analysis.
Decreased planting warranty from 2 years to 1 year	Revised warranty period to more industry standard 1-year period to reduce contractor risk inflation. Future maintenance and replacement to be managed separately from contractor main bid.
Updated material specifications and required testing	Selected materials with local availability and application without additional blending, ease of installation and increased stability.
Consolidated specifications for planting schedule, plants, and planting preparation into single specification	Plant species were updated and availability verified with suppliers. Consolidation of specifications reduces potential for conflicts in language.
Added contractor planting plan, which will allow flexibility in planting techniques (i.e., planting bags rather than divers)	Contractor will now submit a planting plan for approval rather than specifications prescribing planting techniques. Contractor will be allowed some flexibility in planting techniques and selected plant blends.

Notes:
EV = emergent vegetation
NYSDOT = New York State Department of Transportation
SAV = submerged aquatic vegetation
TOC = total organic carbon

Buffalo River Area of Concern - Restoration Element Summary					
Restoration Area	**Restoration Element**	**Unit**	**100% Design Quantity***	**Revised Design Quantity**	**Note**
Katherine Street Peninsula	SAV Planting	Acres	1.02	1.10	100% Design quantity represents SAV areas planted to 8' water depth. Reduction to 6' water depth would have resulted in 0.67 acres of SAV area.
	EV Planting	Acres	0.14	0.11	
	Rock Vanes	Each	9	3	
	Anchored Rootwad Logs	Each	8	8	An additional 9 log poles have been added to the Revised Design.
City Ship Canal	SAV Planting	Acres	2.04	2.46	100% Design quantity represents SAV areas planted to 8' water depth. Reduction to 6' water depth would have resulted in 0.92 acres of SAV area.
	EV Planting	Acres	1.27	0.83	
	Gravel Spawning Bed**	SF	6400	7000	
	Buried Rootwad Logs	Each	13	20	
	Anchored Rootwad Logs	Each	6	0	
Riverbend	SAV Planting	Acres	0.48	0.48	100% Design quantity represents SAV areas planted to 8' water depth. Reduction to 6' water depth would have resulted in 0.29 acres of SAV area.
	EV Planting	Acres	0.85	0.88	
	Rock Vanes	Each	7	3	
	Anchored Rootwad Logs	Each	14	20	
	LUNKERS	Each	4	0	
Buffalo Color Peninsula	SAV Planting	Acres	0.62	0.42	100% Design quantity represents SAV areas planted to 8' water depth. Reduction to 6' water depth would have resulted in 0.52 acres of SAV area.
	EV Planting	Acres	1.26	1.17	
	Rock Vanes	Each	9	12	
	Anchored Rootwad Logs	Each	0	5	
Ohio Street Shoreline	SAV Planting	Acres	0.03	0	All areas within SAV planting elevations have greater than 2H:1V slope and have been eliminated from the revised design.
	EV Planting	Acres	0.05	0.05	
	LUNKERS	Each	3	0	

Notes:

*Quantities from 100% Habitat Design BODR (March 2013). Tables 2a through 2e.

**Gravel spawning bed quantities for 100% Design from 90% Design Cost Estimate (January 2013)

EV = emergent vegetation

H:V = horizontal to vertical (ratio)

SAV = submerged aquatic vegetation